

# **STRUCTURAL EXCAVATION AND BACKFILL - Section 802**

---

Earthwork forms a part of the installation procedures of box culverts, retaining walls, foundations, and substructures. In order to ensure an adequate foundation for such structures, backfill material must meet certain specifications and be compacted by acceptable methods to adequate density. The use of poor soils as a bed for a structure and the failure to adequately compact soils surrounding any foundation can lead to premature failure.

Backfill shall be of acceptable quality, free from large or frozen lumps, wood or other foreign material.

No backfill shall be placed against a concrete abutment, wing wall or reinforced concrete box culvert until concrete has been in place at least 14 calendar days or until test cylinders made in accordance with DOTD TR 226 and tested in accordance with DOTD TR 230 have obtained a minimum compressive strength of 3000 psi.

The scope of this section is limited to the earthwork associated with the construction of structures.

## **SHORING**

The contractor shall adhere to all state and federal guidelines in providing protection against the cave-in of any excavated area. The contractor shall not conduct operations in the trench unless adequate shoring is in place, when needed, all safety provisions are met, and all federal and state guidelines for protection are met. The safety of the excavation depends on the characteristics of the material in which the excavation is made, seepage, depth of excavation, and side slopes. Trenches shall be braced when needed to prevent the sloughing of side or top material. The contractor shall take all measures necessary to protect workers in the trench area and shall provide them with safety equipment as needed. The design of shoring in no way affects the specification density requirements for the full width and depth of the trench.

## **BOX CULVERTS**

The contractor shall excavate the trench wide enough to allow for construction activity. Generally, at least 18 inches on each side of the neat lines of the box will be adequate to allow for normal construction activity. The bottom of the excavation must be graded to match the flow line shown on the plans. The subgrade shall be compacted as necessary when directed to provide a firm foundation for the box culvert.

When suitable foundation cannot be obtained, unstable soil below plan grade shall be removed and the bottom of the excavation shall be reconstructed with specified soil conforming to Specification Subsection 203.06. If bedding material is specified or required, the excavation shall be excavated below grade and bedding material used to achieve plan elevation. Even when bedding material is not specified, it may be necessary when unstable or unsatisfactory material is encountered. Examples of

unsatisfactory or unstable material include excessive moisture content, high organic content, water seepage, soft materials, and excessive P.I. **When water seepage occurs, bedding material will be required. A concrete seal may be permitted in lieu of bedding material at no direct pay. Clay seals are not an acceptable solution.** Replacement material shall be compacted as directed to at least the density of the surrounding soils.

Prior to the placement of forms or reinforcing steel in the box bottom, project personnel will check the foundation will be checked for flow line. It will also be visually inspected for uniformity of compaction, unstable areas, etc. the contractor shall correct deficiencies prior to proceeding with box culvert construction.

## **BACKFILLING**

**Compaction of backfill material by flooding will not be permitted.**

Box culverts shall be backfilled with selected soil conforming to Specification Subsection 203.06(b), flowable fill meeting the requirements of Specification Section 710, or granular material conforming to Specification Subsection 1003.07. Plastic soil blanket for all installations shall conform to the requirements of Specification Subsection 203.10. All materials shall be tested and approved prior to use.

Before any construction equipment is allowed to cross the box culvert, at least 2 feet, compacted thickness, of backfill shall be placed over the top. The backfill will help prevent the equipment from damaging the culvert. If the final thickness of cover over the installed box culvert is less than two feet, the contractor shall install the box culvert after all heavy hauling has been completed. If it is not possible to install the box culvert after it is no longer necessary to cross the box culvert with heavy equipment, with the approval of the engineer, the contractor shall install the culvert and place excess material over the installed culvert to a compacted depth of at least two feet. After all heavy hauling has been completed, the contractor shall remove the excess material to grade.

Backfill material shall be of uniform soil characteristics and moisture content and shall be placed in lifts of uniform thicknesses. Lift thickness may require adjustment based on soil characteristics, but shall not be increased above the specification requirements. Project personnel will check the lift thickness during placement. Lift thickness shall be uniform both vertically and horizontally and shall be correlated with compactive effort to achieve specification density. The portion of lifts in excess of specification requirements shall be removed and the lift recompacted.

## **SELECTED SOILS**

Selected soils backfill shall be placed and compacted in lifts not to exceed six inches compacted thickness. Optimum moisture will be determined in accordance with DOTD TR 415 or TR 418. Each layer shall be compacted to at least 95% of maximum density as determined in accordance with DOTD TR 415 or TR 418. Project personnel will determine percent compaction in accordance with DOTD TR 401.

## **GRANULAR MATERIAL**

Granular material backfill shall be placed and compacted in lifts not to exceed twelve inches compacted thickness. Optimum moisture will be determined in accordance with DOTDTR 415 or TR 41. Each layer shall be compacted to at least 95% of maximum density as determined in accordance with DOTD TR 415 or TR 418. Project personnel will determine percent compaction in accordance with DOTD TR 401.

## **COFFERDAMS AND CRIBS**

Cribs and cofferdams shall be backfilled with soil, approved by the engineer, and compacted as directed to the satisfaction of the engineer. The finished elevation of the compacted backfill shall be that of the surrounding ground. Backfilling will continue to the surface of the surrounding ground maintaining approximately equal elevations on both sides of the structure.

## **FOOTINGS**

Final excavation to grade shall not be performed until just before the placement of reinforcing steel or concrete. When the bottom of the excavation is soil, the grade shall not be disturbed prior to the placement of concrete. When the bottom of the excavation is rock or other hard foundation material, it shall be cut to a firm surface as directed and all loose material removed. Any open seams shall be cleaned and filled with concrete, mortar or grout to the satisfaction of the engineer. Footing excavations shall be dewatered and made as dry as possible prior to the placement of backfill. Backfill material as specified shall be placed in lifts as directed and compacted as directed to the satisfaction of the engineer.

## **OTHER STRUCTURES**

Excavations shall be dewatered and made as dry as possible prior to the placement of backfill. Backfill material, as specified, shall be placed in lifts not to exceed nine inches loose thickness as directed and uniformly compacted as directed to the satisfaction of the engineer.

**No jetting of backfill behind abutments and wingwalls will be permitted.**

## **QUALITY ASSURANCE**

Quality Assurance, both QC and Inspection and Acceptance, shall be conducted in accordance with Specification Section 701.